CENAE–R-P June 2, 2016

MEMORANDUM FOR: Rodney Howe, Project Manager, CENAE-R-C

SUBJECT: Sampling and Analysis Plan for CITGO Terminal, Fore River, South Portland, ME, Application Number NAE-2006-03991.

1. In response to your request of March 14, 2016, I developed a sampling plan for the above project. The applicant is proposing to dredge an area of approximately 38,803 square feet to a depth of –39' MLLW in the vessel berth, except for the trench area along the pier face where the dredge depth will be -42' MLLW; these depths include one foot of overdredge allowance. This activity will produce a volume of approximately 5,450 cu. yds. of sand and silt material. The applicant proposes to mechanically dredge this material and dispose of it at the Portland Disposal Site (PDS). This area was last dredged in 2008.

2. Please note that the Regional Implementation Manual for the Evaluation of Dredged Material Proposed for Disposal in New England Waters (RIM), effective May 6, 2004, as well as requirements for electronic submission of data, may be downloaded from the website http://www.nae.usace.army.mil/Missions/Regulatory/DredgedMaterialProgram/RegionalImplementationManual.aspx.

All data reports from labs that do not have an approved Laboratory Quality Assurance Plan on record at the New England District Corps of Engineers **WILL NOT be accepted.** Applicants and their agents should verify that their laboratory and any sub-contracting laboratory has, or is working towards, a valid LQAP before retaining their services.

3. SPILLS AND OUTFALLS: The applicant's consultant, Andrew Nilson (Childs Engineering Corp.), stated in an email to me on April 6, 2016, that CITGO informed him that they do not have any record of spills taking place on their waterfront facility since the 2007 berth sediment testing. The dredging of this area was completed under the previous permit and took place in late 2008.

4. Nine (9) cores should be taken from the areas to be dredged according to the attached plan. Core samples should be taken to the proposed dredge depth plus the overdredge amount. The cores should be inspected in the field for stratification. If the cores show significant stratification, in the opinion of the sampling crew, subsamples should be made of each layer. Sufficient material should be taken for the following required tests: a bulk sediment chemistry analysis, a 10-day bioassay, a 28-day bioassay/bioaccumulation test and a suspended particulate assay. Chemical analysis should be performed on the

elutriates and water used in the suspended particulate assay. All sediments being held for testing should be stored in accordance with the requirements of Table 8-2 in Evaluation of Dredged Material Proposed for Ocean Disposal, Testing Manual, 1991(referred to in this document as the Green Book).

5. Please provide coordinates for each core location in latitude and longitude, NAD 83 decimal minutes. Required horizontal accuracy of each sample location is 3 meters or less. This accuracy can be achieved with a WAAS-enabled standard boat-mounted or hand-held GPS unit. The accuracy at each sample location shall be reported along with the coordinates. Accuracy can be improved by collecting data at a sampling location for a longer period of time.

6. Each core or core layer should be individually analyzed for sediment grain size and the results reported to me, or, if I am not available, to the Marine Analysis Section (MAS), before any compositing is performed. I will review the data and determine if compositing is appropriate.

7. The reference site sediment should be collected from the PDS Reference Site located at latitude 43˚ 38.6' N and longitude 69˚ 59.01' W.

8. After the grain size analysis is done, the 10-day bioassay test should be run. This test should be performed in accordance with the requirements of the following three documents: the RIM; the Green Book; and Methods for Assessing the Toxicity of Sediment-Associated Contaminants with Estuarine and Marine Amphipods, 1994. The bioassay test should use two species of test animals, the amphipod *Ampelisca abdita* and the mysid shrimp *Americamysis bahia*.

The results of the 10-day bioassay test should be reported to me, or, if I am not available, to MAS, as soon as possible after its completion. If this test shows a statistically significant mortality, in accordance with the above documents, we may decide to cancel the rest of the tests. It is important that the results of this test be reported to me promptly as the sediments have short holding times. In addition, we may decide to further composite the sediments for the bulk sediment chemistry analyses, the suspended particulate bioassay test, and the bioaccumulation test based upon the results of the bioassay test.

9. After we have reviewed the results of the bioassay test, bulk sediment chemistry analyses should be done on designated samples of the dredge area and the reference area materials according to the RIM. The test parameters should include all of the items on the attached sheet. These parameters are extracted from Tables 1, 2 and 3 of the RIM. The reporting limits should be those indicated on the attached sheet. The listed analytical methods are

recommended but can be replaced by other methods that will give the required reporting limits. The Total Organic Carbon analysis (TOC) should be done in duplicate on each composited sample and a TOC Standard Reference Material (SRM) should be run with the sample batch.

These results should be reported to me, or, if I am not available, to the MAS, as soon as possible after its completion, so we can review them and determine what are the contaminants of concern for the bioaccumulation test.

10. The 28-day bioaccumulation test can be started at the same time as the bulk sediment chemistry tests but should not be started before those tests. This test should be performed in accordance with the requirements of the RIM and the Green Book. The bioaccumulation test should use a bivalve, either *Macoma nasuta* or *Macoma balthica*, and the polychaete *Nereis virens* as test animals. At the end of the 28–day test, the tissues of the survivors should be tested for the contaminants of concern according to Table 9 of the RIM. The contaminants of concern will be determined from the above-mentioned bulk sediment chemistry tests. If, at the end of the 28 days, the results of the bulk sediment chemistry analyses are not ready and have not been reviewed by MAS to determine the contaminants of concern, the lab should process the tissues to a convenient and safe stopping point to await notification on the contaminants of concern.

11. The suspended particulate bioassay test should be in accordance with the requirements of the RIM and the Green Book. This test can be started at the same time as the 28-day bioaccumulation and bulk sediment chemistry tests. Three test species shall be used: a crustacean; a fish; and the planktonic larvae of a third species: they are *Mysidopsis bahia*; *Menidia menidia* or *Menidia beryllina*; and larvae of either *Mytilus edulis* or *Arbacia punctulata*.

The chemical analysis of elutriate and dredging site waters is discussed in Section 9.4 of the Green Book. The test parameters should include all of the items on the attached sheet. The reporting limits should be those indicated on the attached sheet. The listed analytical methods are recommended but can be replaced by other methods that will give the required reporting limits.

12. Bulk sediment chemistry analyses should be done on each composite sample according to the RIM. The test parameters should include all of the items on the attached sheet. These parameters are extracted from Tables 1, 2, and 3 of the RIM. The reporting limits should include all of the items on the attached sheet. The listed analytical methods are recommended but can be replaced by other methods that will give the required reporting limits. The Total Organic Carbon analysis (TOC) should be done in duplicate on each

composited sample and a TOC Standard Reference Material (SRM) should be run with the sample batch.

13. Quality Control Summary Tables must be completed and included with each data submission. These tables are found in Appendix II of the RIM and are also available on the RIM website http://www.nae.usace.army.mil/Missions/Regulatory/DredgedMaterialProgram/RegionalImplementationManual.aspx.

14. All sediment data is required to be submitted electronically in the electronic data deliverable (EDD) format available on the RIM website. EDDs may be e-mailed or mailed on CD. Electronic files in a printer-friendly, easy-to-read format (e.g., PDF, MS Word) may be substituted for hard copy submission.

15. Please note the following modification to the 2004 RIM: Any analytes not detected shall be reported as the reporting limit and qualified with a "U". Do not report non-detects as the method detection limit (MDL).

16. If you, the applicant or the testing laboratory have any questions, feel free to contact me at 978-318-8170 or paula.g.kullberg@usace.army.mil.

Paula Kullberg
Project Manager
Marine Analysis Section

BULK SEDIMENT TESTING PARAMETERS

Parameter	Analytical Method	Reporting Limit (ppm)
Metals		
Arsenic	6010B, 6020, 7060, 7061	0.4
Cadmium	6010B, 6020, 7130, 7131	0.07
Chromium	6010B, 6020, 7190, 7191	0.5
Copper	6010B, 6020, 7210	0.5
Lead	6010B, 6020, 7420, 7421	0.5
Mercury	7471	0.02
Nickel	6010B, 6020, 7520	0.5
Zinc	6010B, 6020, 7950	1.0
PCBs (total by NOAA summation of congeners)		
See next page	8082A	0.001
Pesticides	NOAA (1993), 8081B	0.001
Aldrin	Heptachlor epoxide	
cis- & trans-Chlordane	Hexachlorobenzene	
4,4'-DDT, DDD, DDE	Lindane	
Dieldrin	Methoxychlor	
α & β Endosulfan	cis- & trans-Nonachlor	
Endrin	Oxychlordane	
Heptachlor	Toxaphene	0.025
Polyaromatic Hydrocarbons (PAH's)	8270C-SIM	0.01
Acenaphthene	Chrysene	
Acenaphthylene	Dibenzo(a,h)anthracene	
Anthracene	Fluoranthene	
Benzo(a)anthracene	Fluorene	
Benzo(a)pyrene	Indeno(1, 2, 3-cd)pyrene	
Benzo(b)fluoranthene	Naphthalene	
Benzo(k)fluoranthene	Phenanthrene	
Benzo(g, h, i)perylene	Pyrene	
Total Organic Carbon	Plumb (1981), APHA (1995)	0.1%
Percent Moisture	Plumb (1981), EPA (1992), PSEP (1986)	1.0%
Grain Size	Wet Sieve (#4, 10, 40, 200)	

PCB CONGENERS

Analytical Method: NOAA (1993), 8082A

Reporting Limit: 1 ppb

Congeners:

8*	2,4' diCB
18*	2,2',5 triCB
28*	2,4,4' triCB
44*	2,2',3,5' tetraCB
49	2,2',4',5 tetraCB
52*	2,2',5,5' tetraCB
66*	2,3',4,4' tetraCB
87	2,2',3,4,5' pentaCB
101*	2,2',4,5,5' pentaCB
105*	2,3,3',4,4' pentaCB
118*	2,3',4,4',5 pentaCB
128*	2,3,3',4,4' hexaCB
138*	2,2',3,4,4',5' hexaCB
153*	2,2',4,4',5,5' hexaCB
170*	2,2',3,3',4,4',5 heptaCB
180*	2,2',3,4,4',5,5' heptaCB
183	2,2',3,4,4',5',6 heptaCB
184	2,2',3,4,4',6,6' heptaCB
187*	2,2',3,4',5,5',6 heptaCB
195*	2,2',3,3',4,4',5,6 octaCB
206*	2,2',3,3',4,4',5,5',6 nonaCB
209*	2,2',3,3',4,4',5,5',6,6' decaCB

* denotes a congener to be used in estimating Total PCB. To calculate Total PCB, sum the concentrations of all eighteen congeners marked with a "*" and multiply by 2.

The specified methods are recommendations only. Other acceptable methodologies capable of meeting the Reporting Limits can be used. Sample preparation methodologies (e.g. extraction and cleanup) and sample size may need to be modified to achieve the required Reporting Limits.

ELUTRIATE TESTING PARAMETERS

Parameter	Recommended Analytical Method	Reporting Limit (µg/L)
Metals		
Arsenic	200.9, 1632	1.0
Cadmium	200.9, 1637	1.0
Chromium (VI)	218.6, 1636	1.0
Copper	200.9, 1639, 1640	0.6
Lead	200.9, 1639, 1640	1.0
Mercury	245.7, 1631	0.4
Nickel	200.9, 1639, 1640	1.0
Selenium	200.9, 1639	1.0
Silver	200.9	0.5
Zinc	200.9, 1639	1.0
PCBs (total, by either of these methods)		
	3510B, 8080A, NYSDEC	0.006
Pentachlorophenol	3501B, 8270C	2.60
Pesticides	3510B, 8080A	
Aldrin		0.26
Chlordane		0.02
Chloropyrifos		0.002
Dieldrin		0.14
4, 4'-DDT		0.03
α & β Endosulfan		0.007
Endrin		0.007
Heptachlor		0.01
Heptachlor epoxide		0.01
Lindane		0.26
Toxaphene		0.04

Reference:

NYSDEC. 1991. Analytical Method for the Determination of PCB Congeners by Fused Silica Capillary Column Gas Chromatography with Electron Capture Detector. NYSDEC #91-11.